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VITAMIN B_{12} AND PENICILLIN SUPPLEMENTS IN POULTRY NUTRITION

BY

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During the last three or four years a considerable amount of research has been directed to assessing the value of the so-called Animal Protein Factor(s) and of antibiotics in poultry nutrition. During this period a vast literature has accumulated on these two subjects and has been summarised by various authors (Coates *et al.*, 1952; Coles & Preston, 1950; Cuthbertson, 1952; Ford, 1952). A brief report of recently completed investigations at this Station may not be amiss.

It has long been recognised that protein derived from animal sources has a higher nutritive value than vegetable protein for certain classes of livestock, especially pigs and poultry. This difference has been ascribed to the poorer content in vegetable proteins of one or more of the essential amino-acids. That this is not entirely so has been one of the major discoveries in animal nutrition during the last decade.

The discovery of a factor or group of factors associated with animal protein but not found in vegetable protein arose from the exigencies of the last war. In the United Kingdom and the U.S.A. it was essential to conserve and ration vital foodstuffs in all spheres of livestock nutrition. The vital importance of pigs and poultry as a source of food for human consumption has not declined since the end of the war, but has increased with the rapidly increasing world population. The scarcity of animal protein has necessitated the use of cheaper and more abundant products of plant-origin in the feeding of these animals.

Work in the U.S.A. during the years 1932-37 had shown that if an all-vegetable ration, in which soyabean meal was the sole source of protein concentrate, was fed to laying hens, a marked decrease in hatchability occurred which could not be rectified by such supplements as manganese, riboflavin, etc. However, improvement did occur when the soyabean meal was partially replaced by meat-scraps. Here it must be stressed that the American type of poultry ration is very different from that used in the United Kingdom.

In the U.S.A. soyabean meal, one of the best vegetable proteins, constitutes between 25 and 35 per cent. of the ration, the main source of carbohydrates being maize. On the other hand, groundnut meal is the most abundant vegetable protein available in the United Kingdom and the carbohydrate fraction is mainly a mixture of wheat, barley, oats and offals. At the time these experiments were in progress Statutory Regulations insisted on the inclusion of some animal protein, skim milk or yeast. These facts are important when interpreting the results of American work dealing with the Animal Protein Factor(s) and antibiotics.

Bird *et al.* (1946) showed that with a corn/soya ration, although there was no adverse effect on egg production, bodyweight or egg size, hatchability significantly decreased in spite of an adequate supply of all the then known essential micro-nutrients. The viability of the chicks was also impaired. However, the hatchability could be rapidly improved if some of the soyabean meal was replaced either by cow manure, sardine meal, skim milk or butyl fermentation solubles. From these and other experiments it was agreed that there was a chick-growth factor, a vitamin-like material found in close association with animal protein, which, when added to experimental rations containing an adequate amount of all the essential amino-acids and identified vitamins, still promoted increased growth. This factor, or factors, also appeared necessary to the maintenance of satisfactory hatchability. It was Rubin & Bird (1946) who showed that this factor(s) could be extracted and concentrated from cow manure and not only did it maintain high hatchability but the chicks could be reared successfully on a ration devoid of any animal protein. It was the demonstration of this transmissibility that explained the confusing results obtained by other workers, some of whom had denied the existence of such a factor. When the anti-pernicious anaemia factor, vitamin B_{12}, was isolated in 1948, it was claimed by Ott *et al.* (1948) to be identical with, or closely related to, this chick-growth and hatchability factor now known as the Animal Protein Factor. However, evidence has now accumulated (Coates, 1952; Coles & Preston, 1950) which indicates that vitamin B_{12} is only one component of the A.P.F. and that the latter is of a more complex nature. The complete group of factors is found only in crude, unrefined natural materials such as fish solubles, liver extracts and dried whey.

In the U.S.A. so-called A.P.F. concentrates now began to appear and these were mainly fermentation residues from antibiotic production which contained vitamin B_{12}. In two classical papers Stokstad *et al.* (1949) and Stokstad & Jukes (1950) showed that such A.P.F. concentrates obtained as by-products in the manufacture of aureomycin had a growth-promoting activity for chicks exceeding that of their vitamin B_{12} content. This, they showed, was due to traces of antibiotic remaining in the concentrates. Thence followed a spate of papers, mainly from the U.S.A., which appeared to confirm that pure antibiotics, when fed to young chicks, improved their growth-rate. Of the antibiotics tested, aureomycin, streptomycin and penicillin appeared to be the most effective. The results obtained in the United Kingdom have not been so dramatic as those found in the U.S.A., although some growth stimulation has been found, not only with all-vegetable rations but also when birds are fed practical rations containing animal protein (Coates *et al.*, 1951). On the other hand, some negative results have been reported (Coates *et al.*, 1952; King & White, 1953) and it appears that the degree of growth stimulation is closely linked to the environment of the growing chicks. Recently, a symposium organised by the U.K. Branch of the World's Poultry Science Association (1953) on antibiotics in poultry nutri-

tion reviewed the present state of knowledge under U.K. conditions of husbandry. Although a marked increase in growth-rate was claimed during the first four to six weeks of life, there was a steady "falling-off" in effect after this period until the advantage in live-weight gain ranged from 0 to 11 per cent. at 10 to 14 weeks of age.

The purposes of the experiments reported in this paper were to determine the effect of penicillin and vitamin B_{12} supplements on growth, production and hatchability of poultry.

Experimental Procedure

A group of 300 Brown Leghorn × Barred Rock chicks were divided into six groups each comprising 30 pullets and 20 cockerels. Each group of 50 chicks was then reared on one of the following experimental diets:—

A.—Standard ration in use at the Animal Health Trust Research Station, Houghton Grange.

B.—As A but with the fish meal replaced by groundnut meal.

C.—As B but with the addition of a commercial vitamin B_{12} supplement.

D.—As A but half the fish meal replaced by groundnut meal plus a vitamin B_{12} supplement.

E.—As A but supplemented with penicillin.

F.—As E plus a vitamin B_{12} supplement.

Composition of Experimental Rations

	A %	B %	C %	D %	E %	F %
Dredge corn	21½	21½	21½	21½	21½	21½
Oats	7½	7½	7½	7½	7½	7½
Wheat	12½	12½	12½	12½	12½	12½
Yellow maize	15	15	15	15	15	15
Middlings	15	15	15	15	15	15
Maize gluten feed	5	5	5	5	5	5
Grass meal	7½	7½	7½	7½	7½	7½
White fish meal	10	—	—	5	10	10
Groundnut meal	—	10	10	5	—	—
Dried milk	2½	2½	2½	2½	2½	2½
Dried yeast	2½	2½	2½	2½	2½	2½
Minerals	1¼	1¼	1¼	1¼	1¼	1¼
Synthetic vitamin D_3	+	+	+	+	+	+
Riboflavin supplement	+	+	+	+	+	+
Procaine penicillin supplement	—	—	—	—	+	+
Vitamin B_{12} supplement	—	—	+	+	—	+

The riboflavin supplement was added at the rate of 1 lb. per ton to supply the equivalent of 2·23 μg. per g. in the ration. The vitamin B_{12} supplement was added at the rate of 4 lb. per ton in ration C, 2 lb. per ton in rations D and F. Each pound of supplement provides the equivalent of 6·80 mg. of the vitamin. The procaine penicillin supplement was added at the rate of 2 lb. per ton to supply 2 grammes of pure procaine penicillin per ton.

The six groups were reared intensively in a solid floor brooder house on sawdust litter, which was changed weekly. Thermostatically controlled electric brooders were used and the temperature reduced 5° F. each week until at six weeks the heat was discontinued. The birds were kept on these experimental rations, *ad lib.* feeding being permitted, until 16 weeks of age, when the cockerels were killed. The pullets were retained and transferred to laying cages for egg production and hatchability. The formulae of the experimental rations were slightly altered, whereby skim milk was omitted and the middlings increased to 17½ per cent. The supplements were added at the same rate as before. In addition, an oyster shell/flint grit mixture was provided and the birds received a daily allowance of 2 oz. of mixed grain (wheat and oats) from 20 weeks of age. A 12-hour day was provided by the provision of artificial light. Once per week 15 pullets were artificially inseminated from the pooled semen obtained from pure Barred Rock cockerels (maintained on the standard ration).

Analysis of Experimental Rations

1. *Chick Mashes*

	A %	B %	C %	D %	E %	F %
Protein	19·2	18·0	18·7	19·2	20·3	19·5
Oil	3·0	2·5	2·7	2·8	3·4	3·3
Fibre	6·8	7·3	6·1	5·1	6·5	6·7
Ash	6·8	5·2	5·0	5·9	6·3	6·1
	μg./g.	μg./g.	μg./g.	μg./g.	μg./g.	μg./g.
Riboflavin	15·0	21·8	16·8	16·7	22·8	23·1
Vitamin B_{12}	0·043	0·041	0·054	0·055	0·040	0·051

2. *Breeders' Mashes*

	A %	B %	C %	D %	E %	F %
Protein	18·6	18·0	17·2	18·6	19·3	19·2
Oil	3·9	3·3	3·3	3·3	3·8	3·5
Fibre	5·5	5·4	5·7	5·7	6·0	5·3
Ash	5·8	4·5	5·4	5·4	5·4	5·7
	μg./g.	μg./g.	μg./g.	μg./g.	μg./g.	μg./g.
Riboflavin	7·5	5·8	9·2	8·1	7·7	9·7
Vitamin B_{12}	0·0069	0·0023	0·0292	0·0126	0·0054	0·0180

No attempt was made to equalise the mineral and protein content of the diets, since only a slight lowering is to be expected with rations B and C.

Experimental Results

1. *Growth tests* (average weights).

(*a*) *Cockerels:* (see Table I).

Table I

Growth Tests (Average Weights) (*a*) Cockerels

Group	A		B		C		D		E		F	
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
4 weeks	–	11·0	–	8·8	–	8·8	–	10·4	–	11·2	–	11·2
6 ,,	1	4·4	1	—	1	0·2	1	3·2	1	4·6	1	4·2
8 ,,	1	14·1	1	8·9	1	10·3	1	13·9	1	14·8	1	15·1
12 ,,	3	4·2	2	14·5	3	0·8	3	3·5	3	3·5	3	3·9
16 ,,	4	8·2	4	0·9	4	6·6	4	6·7	4	4·7	4	5·4

Relative	Group					
	A	B	C	D	E	F
6 weeks	100	78	80	94	101	99
12 ,,	100	89	94	99	99	99
16 ,,	100	90	98	95	95	96

(Expressed as a percentage of the control group on ration A)

(*b*) ***Pullets :*** (see Table II).

TABLE II

GROWTH TESTS (AVERAGE WEIGHTS) (*b*) PULLETS

Group	A		B		C		D		E		F	
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
4 weeks	–	9·6	–	8·5	–	7·9	–	9·3	–	10·3	–	10·0
6 ,,	1	1·3	–	15·1	–	14·1	1	0·4	1	2·1	1	1·7
8 ,,	1	10·5	1	7·1	1	6·7	1	9·2	1	10·9	1	11·1
12 ,,	2	11·7	2	6·0	2	6·6	2	9·5	2	12·0	2	12·6
16 ,,	3	10·1	3	6·2	3	6·2	3	7·6	3	9·3	3	10·1
24 ,,	5	10·8	4	13·1	4	11·7	5	0·6	5	0·8	5	2·3

Relative	Group					
	A	B	C	D	E	F
6 weeks	100	87	82	95	105	103
12 ,,	100	87	88	95	101	102
16 ,,	100	93	93	96	99	100
24 ,,	100	95	94	100	100	102

(Expressed as a percentage of the control group on ration A)

2. ***Production and hatchability results :*** (see Table III).

TABLE III

PRODUCTION AND HATCHABILITY RESULTS

Ration	% Production (Nov., 1952–Feb., 1953 : 18 weeks)	Hatchability (Nov., 1952–Feb., 1953 : 18 weeks)							
		Eggs set	Eggs infertile		D.I.S.		Hatched		Fertiles hatched
			No.	%	No.	%	No.	%	%
A	83·2	539	114	21·2	64	11·9	361	67·0	84·9
B	65·2	463	131	28·3	149	32·2	183	39·5	55·1
C	64·1	471	144	30·6	71	15·1	256	54·4	78·3
D	84·6	555	141	25·4	57	10·3	357	64·3	86·2
E	78·7	599	148	24·7	50	8·3	401	66·9	88·9
F	86·6	585	141	24·1	48	8·2	396	67·7	91·2

DISCUSSION

(*a*) *Growth Tests.*—The complete replacement of the fish meal in the standard ration by an equal amount of groundnut meal (*i.e.*, ration B) has markedly reduced the early growth-rate of the cockerels and pullets. This retardation of growth has lessened with increasing age until at maturity the pullets are on the average only 5 per cent. lighter than the control birds. Although ration B is not wholly all-vegetable, since skim milk (2½ per cent.) is included, it does indicate that groundnut meal does not meet the dietary requirements for certain amino-acids during early growth. This is not unexpected since this vegetable protein is known to be low in both lysine and methionine. However, with continued growth it appears that the critical requirements for the essential amino-acids tend to diminish and the ration becomes almost adequate. Some of the poorer growth on this ration may also be attributed to its slightly lower protein content since no attempt has been made to equalise the protein level with that of this control ration, the fish meal being simply replaced part for part by groundnut meal. This result would appear to be in line with those reported by Carpenter & Duckworth (1952). These workers showed that the weight of pullets at 21 weeks of age reared on all-vegetable rations containing groundnut meal was equal to that of birds fed a ration containing fish meal.

The addition of a vitamin B_{12} supplement to ration B has not effected any marked improvement in the growth-rate of the pullets, although the cockerels appeared to have benefited. This is probably fortuitous since all the chick mashes are probably more than adequate in vitamin B_{12}. The exact requirement of the growing chick for this vitamin has not been stated with absolute certainty. The requirement would, however, appear to be extremely low, being of the order of 0·027 μg. per g. (equivalent to about 27 mg. per ton) for depleted chicks from depleted hens (Ott, 1951) and about 0·004 μg. per g. (equivalent to 4 mg. per ton) for chicks hatched from the eggs of dams on an adequate ration (Peterson *et al.*, 1953). It must be remembered, however, that these results were obtained with the corn/soya type of ration. Since the lowest vitamin B_{12} content of our starting ration was of the order of 40 mg. per ton, the further addition of any supplement has been entirely superfluous. With starting rations it appears that the amino-acid composition is of much greater importance than their vitamin B_{12} content. It has been demonstrated (Carpenter & Duckworth, 1952) that 2½ per cent. condensed fish solubles (a good source of the A.P.F. complex) added to an all-vegetable ration containing 23½ per cent. groundnut meal did not promote as good growth as a ration containing 7½ per cent. fish meal and 3 per cent. dried whey in chicks up to six weeks of age. Beyond this, such a ration proved equal to the standard ration as also did all-vegetable rations containing 19 and 25 per cent. groundnut meal respectively, but no source of vitamin B_{12}. Since 2½ per cent. C.F.S. may be expected to supply the vitamin B_{12} requirement for the growing chick hatched from parents maintained on an adequate breeder ration, groundnut meal even at 23½ per cent. has not quite met all the amino-acid requirements. Thus, the addition of a vitamin B_{12} supplement, which incidentally is only one of the factors of the A.P.F. complex, to an all-vegetable or low-animal protein ration cannot compensate for any amino-acid or other vitamin deficiency which is likely to occur in such a ration. This is also borne out by our ration D (containing only 5 per cent. fish meal, 5 per cent. groundnut meal and a vitamin B_{12} supplement). Early growth has been slightly retarded but at maturity no difference exists, when compared with birds receiving the standard ration.

These deficiencies may in fact be rectified by raising the level of the protein concentrate without any vitamin B_{12} being present (Carpenter & Duckworth, 1952). Our experiments would appear in part to confirm these observations. Since 2½ per cent. skim milk will supply more than an adequate amount of the chick's requirement for vitamin B_{12}, the mere addition of more supplement is unnecessary and does not compensate for the inferior amino-acid composition of the vegetable protein concentrate used. Any use of such supplements in practice must be accompanied by a careful consideration of the supplementary relationship existing between various vegetable proteins, to ensure no amino-acid imbalance occurs on omitting animal protein.

The addition of the penicillin supplement to the standard ration has not stimulated any prolonged increased growth-rate. Some improved growth has occurred in pullets up to six weeks of age, but the advantage has not been maintained. Since these experiments were conducted in a brooder house which had been empty for two months prior to commencing this experiment, these results were not

+ See Errata p. 124

altogether unexpected in view of the theory advanced by Coates *et al.* (1952). It does appear that the growth-response to an antibiotic is very much conditioned by the environment which in our experiments was superior to the average commercial farm. The further addition of a vitamin B_{12} supplement to a ration containing penicillin, thus providing a superoptimal amount of the vitamin, did not improve the growth of either cockerels or pullets up to 16 or 24 weeks respectively when compared with the growth of birds on our standard ration.

(*b*) *Production and Hatchability Test.*—Egg production of birds fed the standard ration alone and supplemented with penicillin and/or vitamin B_{12} has been maintained at the high level expected with such rations. The supplements have not exerted any marked effect. In contrast, however, the production of birds receiving the all-vegetable ration has been markedly lowered. This observation does not conform to the findings of Carpenter *et al.* (1953), who found that in general an all-vegetable ration can maintain egg production equal to that of a ration containing animal protein. In our experiment it appears that production is again closely linked to the amino-acid composition of the ration. The vitamin B_{12} supplement has effected no improvement, which is in line with published work.

With regard to the hatchability results, it appears that again the addition of either penicillin alone or penicillin plus vitamin B_{12} to an otherwise adequate ration has effected no marked improvement in hatchability. Conversely, the hatchability of eggs from pullets fed the all-vegetable ration has been significantly reduced and this was partially remedied by the addition of vitamin B_{12} but not completely. It appears that in addition to vitamin B_{12} there is in fish meal an additional factor necessary for optimal hatchability, since the latter ration assayed at 0·0069 μg. per g. vitamin B_{12}, whereas the all-vegetable supplemented with vitamin B_{12} was 0·0292 μg. per g. This confirms the complex nature of the Animal Protein Factor reported by other workers (Cumber, 1951; Black *et al.*, 1951).

Conclusion

1. A commercial penicillin supplement when added to an adequate ration effected no improvement in growth, production or hatchability, of chicks maintained under the conditions of management described.

2. A vitamin B_{12} supplement added to a ration low in animal protein and where the main source of plant protein was groundnut meal, did not maintain as good a growth as a ration containing fish meal, as the principal source of protein at a level of either 10 or 5 per cent. respectively.

3. Production by birds in cages was significantly lower on an all-vegetable ration when compared with the standard ration containing animal protein, and a vitamin B_{12} supplement effected no improvement. The addition of penicillin and vitamin B_{12} to the standard ration did not improve production.

4. The hatchability of birds maintained on wire has improved by the addition of a vitamin B_{12} supplement to an all-vegetable ration but not to the same extent as one containing 10 or 5 per cent. fish meal. Hatchability of birds on rations containing both penicillin and vitamin B_{12} was higher than that of birds on the standard ration only.

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SEASONAL FLUCTUATION IN THE NUMBER OF STRONGYLE EGGS PASSED BY HORSES

BY

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A recent paper by Kalmus (1953) gave an account of the fourth conference of the International Society for the Study of Biological Rhythms at which 42 papers were read dealing with many aspects of this phenomenon and showing something of its diversity and complexity. Probably the best known rhythmical phenomena are those of diurnal and seasonal fluctuations whose relationship to the change of intensity of certain stimuli in the environment is obvious. Seasonal fluctuation is known in heminthology; Zawadowsky & Zvjaguintzev (1933) reported it in the number of *Nematodirus helvetianus* eggs disseminated in the faeces of a llama, Taylor (1935) observed it in the number of Trichostrongylid eggs in the faeces of ewes, and more recently Morgan, Parnell & Rayski (1950, 1951, 1952) have surveyed and carefully correlated information on worm egg output fluctuation and actual worm burden variation in sheep.

This paper offers evidence of a seasonal fluctuation in the number of strongyle eggs passed by horses, based upon information which has been accumulated since July, 1951. The results were obtained by observing 16 pony mares which were born between 1935 and 1948. Faeces samples were collected every fortnight and the number of strongyle eggs per gramme estimated for each specimen. The average egg count for each month was then found. Faeces were cultured once a month in order to keep a check upon the species responsible for egg production. The mares had all acquired strongyles naturally and these consisted of the following species: *Trichonema* spp., *Strongylus vulgaris*, *Strongylus edentatus*, *Strongylus equinus*, *Gyalocephalus* spp., *Trichostrongylus axei*, *Poteriostomum* spp., *Oesophagodontus* spp., and *Triodontophorus* spp. The eggs of *Trichonema* spp. formed the highest proportion of the total strongyle egg count, the next common in occurrence being those of *Strongylus* spp., particularly *S. edentatus* and *S. vulgaris;* the eggs of the other species were seen only occasionally.

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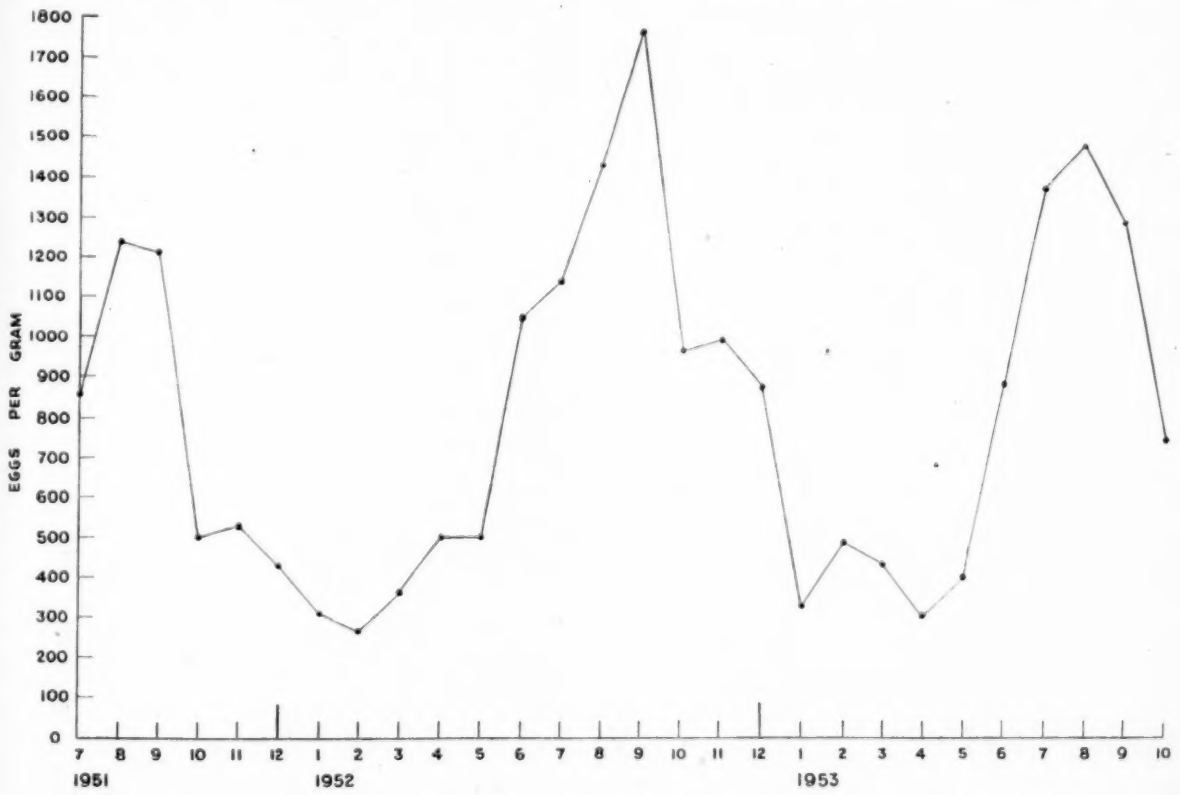
The mares comprised 10 Shetlands or crossbred Shetlands, five pure bred Welsh Mountain ponies and one New Forest pony. All were of average or above average quality. They were grazed on paddocks at the E.R.S. Field Station at Lanwades Park, near Newmarket, where they were kept throughout the duration of the observations. These pony mares are kept as a breeding stud to supply experimental animals for other purposes and consequently they were bred from regularly. During the warmer weather they received no concentrated food, but existed solely on the grass of the pastures; in the colder weather hay was fed and during very severe spells of frost or snow a ration of about 2 lb. per head of crushed oats daily was given for a short spell. From July, 1951, until March, 1953, no anthelmintic treatment was given to any member of the group.

Graph I shows the average egg count for each month from July, 1951, until October, 1953. It will be seen that the minimum of egg production occurs in the winter, during the spring the counts begin to rise and a maximum is reached in August or September, after which a fall to the winter months occurs.

The reason for this seasonal fluctuation in the number of strongyle eggs passed by horses has yet to be definitely established. Zawadowsky & Zvjaguintzev (1933) believed that the eggs of *N. helvetianus* hatched only in the warmer weather, thus winter eggs would not hatch until spring and there would be an accumulation of infective larvae at this season leading to a greater rate of infection with the eventual result of an increase in adult parasites and consequent increase in egg production. Taylor (1935) pointed out that this explanation could not apply satisfactorily to the group of ewes he studied, for, as he states, " winter temperatures are very moderate in the south of England and it seems unlikely that any prolonged delay in the development of infective larvae could take place as a result of low temperatures." Such a criticism is also applicable to the ponies used in these observations.

There are two ways in which an increase of worm egg output per horse may be achieved. First by a basic increase in the rate of egg laying by already established helminths, and second, by an increase in the number of worms, that is, by the establishment in the alimentary canal of fresh helminths which reach sexual maturity. These may conceivably be of different types, some may have been picked up as larvae and completed their development within normal periods, others may have been acquired the season before and have either a naturally longer prepatent period, or their larvae may, for some reason, have become arrested in development during the histotropic stage. A further possibility is that females may reach the intestine and become adult, but may not reproduce until some stimulus affects them at particular times.

In this connection it is pertinent to enquire whether the stimulus responsible for any increase in egg production by established parasites is direct or whether the increase is due to the relaxing of an inhibiting factor which makes itself felt again at the end of the warmer months. In any

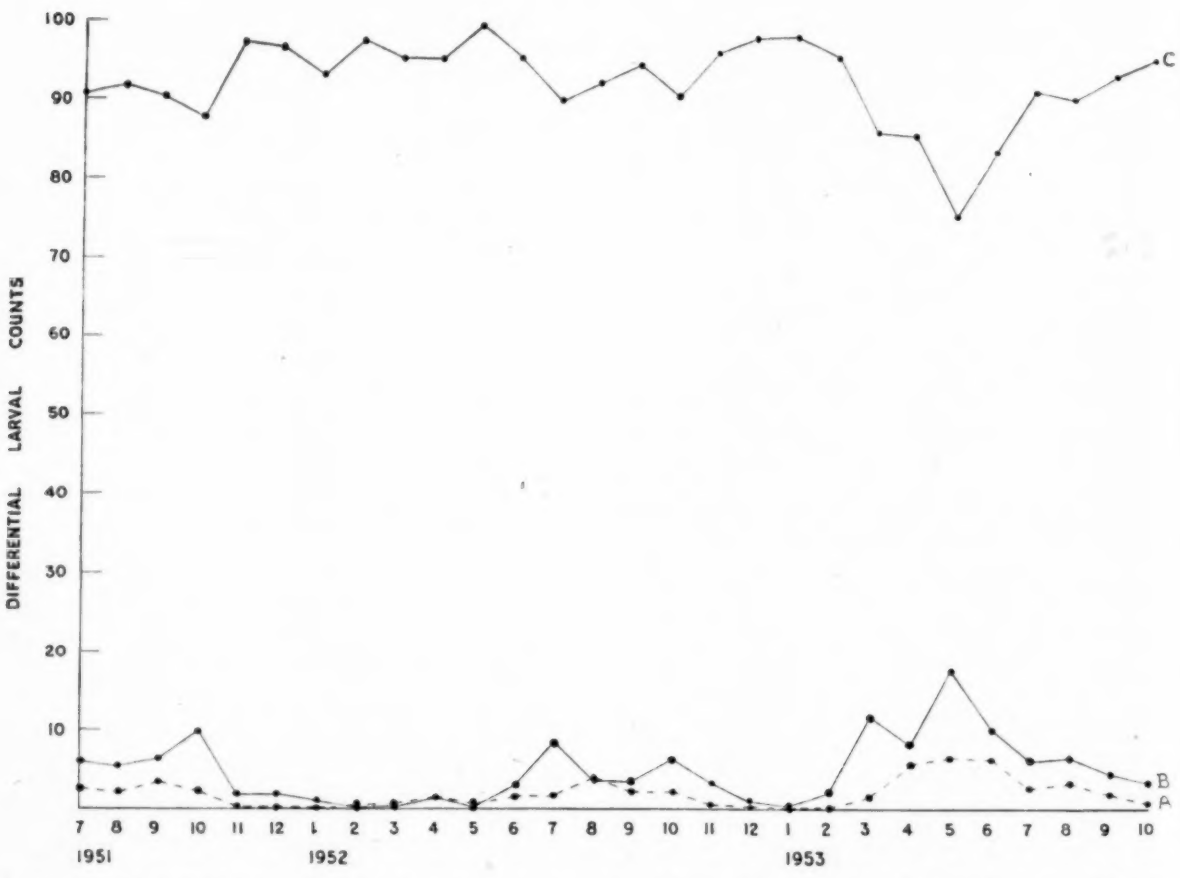


Graph I: Seasonal fluctuation in the number of strongyle eggs passed by horses. The summer increase and winter decrease are easily seen. On March 12th, 1953, phenothiazine was administered to some members of the group.

event the end result will be an increase in the number of eggs laid by the parasites.

Parasites living in the alimentary canal are subject to changes in the environment around them, that is, changes produced by variations in the diet of their hosts. Hegner (1937) has shown that changes in the diet produce changes in the *p*H of the intestinal contents. The fresher grass of the spring and summer may influence the parasites in the equine intestine and the fact that there is then more grass may also be important. The other method by which parasites may respond to changes in the external environment of their hosts is by their intimate contact with the tissues of the latter, the stimulus affecting the host and consequently the parasite. Many animals, particularly insects, are known to reproduce at a great rate in the spring or summer, whilst during the winter reproduction ceases. It is obviously advantageous to have the young produced when external conditions are at an optimum. In the horse strongyles, assuming no accumulation of infective material takes place on the pasture, the primary rise seen in March and April must be due to increased egg production of established parasites which have spent the winter or at least some part of it in the host. Any infective larvae ingested in the winter may also, due to their subsequent maturity, have a part to play in this rise. This primary rise then may be attributed to two factors, an increased egg production by established parasites and the maturation in the intestines of infective larvae picked up during the winter. There can be little doubt, however, that the continuation of the rise is due to the increased rate of infection and consequent increase in number of parasites. Morgan, Parnell & Rayski (1951), working with Scottish hill sheep, showed that the spring rise in worm egg output was correlated with an actual increase in worm burden; they established this by *post-mortem* examination.

In two colt ponies born in May, 1952, and destroyed in January and February of 1953, subsequent *post-mortem* examination revealed numerous *Trichonema* spp. encysted in the mucous and submucous layers of the large intestine. The majority of these were very well developed and it seems likely that they were about to escape into the lumen of the gut, commence reproductive activity and so contribute to the seasonal rise. These two ponies were kept with the experimental mares and were indeed two of their colts. Another colt born of a mare in the experimental group in April, 1952, was destroyed in April, 1953; this pony did not show the abundance of encysted *Trichonema* spp. observed in the other two. Comparison of the number



GRAPH II: Differential larval counts. "A" represents the percentage of *Strongylus vulgaris* larvae hatching from eggs, "B" the percentage of *S. edentatus* and "C" the percentage of *Trichonema* spp. Seasonal activity on the part of *Strongylus* spp. is easily seen and also the relative rise of these parasites after treatment with phenothiazine, on March 12th, 1953.

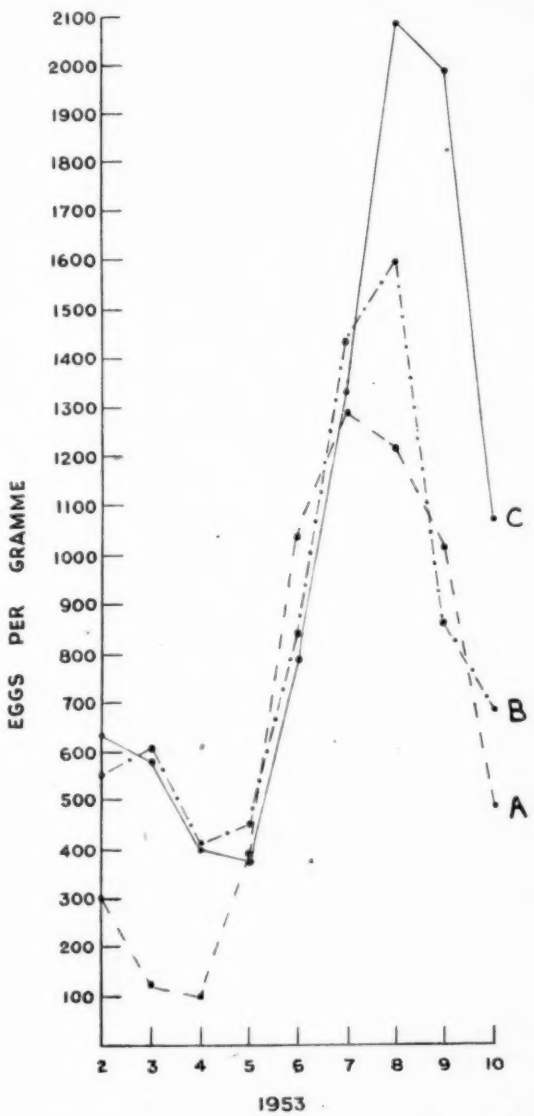
of small strongyles in the large intestines is, however, interesting. The animal slaughtered in January showed 1,045 of these parasites, that slaughtered in February showed 1,213, whilst that killed in April showed 2,628. These figures appear to suggest that the seasonal rise is due to an increased number of parasites; further work is, however, required before this is established.

From purely biological considerations a fluctuation in the actual number of individuals in a strongyle population would be expected, since few animal populations are constant in numbers for any length of time. This is particularly true in invertebrate populations in which, generally speaking, the life histories are shorter than those of vertebrates. Such fluctuations are usually correlated with the environment and it is conceivable that parasites could respond to changes in the external environment of their hosts by stimuli transmitted to them by the latter. This fluctuation is a facet of the wonderful power of adaptation which many parasites possess. A phase of increasing numbers implies no selection while a phase of decreasing numbers implies that the remaining population will be more virile or better adapted than the individuals which have left. It is therefore part of the mechanism of adaptation and consequently of evolution.

The cause of the drop in the number of eggs passed which is seen after August or September may be due to a decreased rate of egg production or it may be due to the death of some of the adult helminths or, of course, to both. There are no natural predators of worm parasites in the alimentary canal and, consequently, death must be due to senescence or to some protective activity on the part of the host. Since the majority of these parasites will commence their parasitic life at the same time of year, it is not unreasonable to suppose that they will end it at approximately the same time. There would, therefore, be a seasonal fluctuation in death-rate, which could explain the drop in egg production.

Graph II summarises the percentage distribution of eggs by species in the whole group based on differential larval counts. It is at once seen that *Trichonema* spp. are responsible for the great majority of the eggs. It is also shown that the reproductive activity of the larger *Strongylus* spp. is at a minimum from November to May, and at a maximum from June to October. These species, therefore, show a good adaption to external environmental factors, for they lay most of their eggs at a time when conditions in the pastures are optimum for larval development. The prepatent period of *S. edentatus* is approximately 11 months, and as the peak for egg production in 1951 occurred in August and at this time about 6 per cent. of the eggs were of *S. edentatus*, it would be expected that the next peak in *S. edentatus* would occur 11 months later. This is so, for in July, 1952, another peak of *S. edentatus* is seen (see Graph II). Graph II also shows that *S. vulgaris* has seasonal fluctuations in its egg production, the latter being at a minimum in the winter months. It is concluded, therefore, that *Trichonema* spp., *S. edentatus* and *S. vulgaris* all show seasonal fluctuation in the number of eggs laid. Eggs of the other species of horse strongyles occurred in numbers so small that no valid conclusions could be drawn. It is apparent from the evidence submitted that attention must be paid to the time of year when interpreting the result of an egg count. As has been pointed out by Miller (1953) a high count in the winter months is potentially more serious than a high count in the summer.

On March 12th, 1953, phenothiazine was administered to some members of the experimental group and this has provided interesting results. Graph III (A) shows the average counts for six ponies, all of which were given 15 grammes of phenothiazine by stomach tube. It is seen that a fall in egg production occurs and that this fall persists until April, whereas in April, 1952, the egg count had commenced to rise, as shown in Graph I. Further, the peak occurs in July and is lower than that observed in 1952, and also lower than that seen in Graph III(B), which represents the average counts of seven ponies receiving only 5 grammes of phenothiazine. In Graph III (C), which is a control group of three animals, all undosed, the peak is



Graph III (A, B, C).—The effect of single doses of phenothiazine upon the seasonal rise. Group "A" received 15 grammes of phenothiazine each, Group "B" 5 grammes each, whilst Group "C" received no treatment and acted as controls. It will be noted that curve "A" reaches a lower peak than "C" and also that the rise recedes more rapidly.

reached in August and is at 2,066 as opposed to 1,287 in Graph III(A). It is thus obvious that phenothiazine reduces the egg count and although it does not prevent the seasonal rise, it causes it to recede more quickly and prevents it reaching the great height seen in the control group.

In this connection it is relevant to note that Leiper (1951) has studied the effect of phenothiazine upon the spring rise in nematode eggs passed by ewes and found that it is prevented by a shock dose followed by low level daily dosing for nine weeks. A similar phenomenon would probably be seen in horses due to the inhibition of egg laying in the helminths by phenothiazine in low level daily doses.

Graph III(A) also provides evidence that the seasonal rise is due to new parasites arriving in the gut, for it shows that after the population has been considerably reduced by phenothiazine, a seasonal rise still occurs—for the curve to reach a maximum at 1,287 must imply the arrival of new individuals. It might also be argued, however, that these have been able to establish themselves only because of the relative absence of parasites in the alimentary canal.

Reference to Graph II shows that the percentage of *Strongylus* spp. larvae seen in differential counts increases rapidly after the administration of phenothiazine to some members of the group. This phenomenon was reported by Poynter (1954) to have occurred in 40 out of 74 horses which were dosed with phenothiazine as a routine procedure. Since then a *post-mortem* examination on a yearling pony colt which received 15 grammes of phenothiazine one month before death has revealed but three *Trichonema* spp. individuals, whilst 31 *Strongylus* spp. individuals were present. This supplies definite proof of the selective action of phenothiazine, but it must be remembered this has been noted in one case only. It seems likely, therefore, that the rise in the percentage of *Strongylus* spp. seen after March in Graph II is due to a greater mortality among the individuals of *Trichonema* spp., as has been also recorded by Gibson (1953).

Summary

1. It has been shown that a seasonal fluctuation exists in the number of *Trichonema* spp., *S. edentatus* and *S. vulgaris* eggs passed by horses.

2. The reason for this is discussed and the opinion is expressed that the rise is referable initially to an increased rate of egg production by existing parasites, this rise being aided and perpetuated by more parasites reaching maturity in the alimentary canal.

3. The effect of phenothiazine upon the rise in the number of eggs passed is noted and evidence of the selective action of this drug on the strongyle population is given.

Acknowledgments.—Thanks are due to Mr. Wm. C. Miller, M.R.C.V.S., F.R.S.E., Director, for helpful suggestions and criticism.

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CLINICAL COMMUNICATION

A CASE OF WARFARIN POISONING IN YOUNG PIGS

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Introduction

The purpose of this paper is to describe a case of Warfarin poisoning in a litter of piglets, and to emphasise the need for care in the use of this rodenticide, since it is often advertised as non-poisonous for domestic animals.

Several cases of poisoning of domestic animals with Warfarin or similar dicoumarol derivatives have been described in the literature. Reihardt & Reihardt (1952) in the U.S.A. recorded a case of Warfarin poisoning in pigs associated with accidental inclusion of Warfarin in pig meal supplied by a feed dealer. Of a total of 120 pigs, 56 died, the majority of which were recently castrated males. Death in these male pigs was associated with haemorrhage from the castration wounds and subcutaneous haemorrhages over the limbs where they had been held. Several female pigs died, death being associated with subcutaneous haemorrhages over the body, limbs and neck, the result of bruising at the feed boxes or bumping by the sow or the other pigs. Dyssegard (1952) mentioned that several pigs in Denmark died from accidental Warfarin poisoning. Christensen (1953) in Denmark recorded two cases of poisoning of pigs with rat poison, Tomorin (3 (alpha parachlorphenyl beta acetylaetyl) 4 oxycoumarin), which resembles Warfarin. In both cases, the pigs affected were approximately 10 to 12 weeks old and showed lameness, pallor and diarrhoea. Subcutaneous haemorrhages and swellings in the region of the larger limb joints were also evident. In the first case, out of a litter of 13 affected, four died, while in the second case, in which six pigs were affected, three died.

Klausman & Brown (1952) in the U.S.A. recorded a case of deliberate malicious poisoning of 61 dogs in one district by laying down food and bones heavily coated with Warfarin; 14 dogs died, the remainder responding to treatment. Bircher (1951) in the U.S.A. recorded a suspected case of Warfarin poisoning in a nine-year-old spayed female Cocker Spaniel, while Boddie & Burgess (1953) in Scotland recorded another suspected case in a two-and-a-half-year-old Collie bitch.

Clinical History

In the present instance, on July 12th, 1953, a commercial Warfarin bait containing 0·5 per cent. Warfarin mixed with pig meal (in proportions of 1 : 19, *i.e.*, 0·025 per cent. Warfarin) in a pail was placed in a pen next to that occupied by a sow and her four-week-old litter of 11 piglets. A few hours later, some of the piglets were noticed to have gained access to this baited pig meal and the pail was immediately removed. By this time 1½ to 2 lb. of baited meal had been consumed. Some chaff including that around the pail was thrown into the adjacent pen containing the sow and her piglets.

On July 13th the male piglets were castrated and on the morning of July 15th one castrated male piglet (Autopsy No. 1) was found dead, while another died during the forenoon of that day (Autopsy No. 2). One female piglet had a swollen neck and died later, July 17th, 1953

(Autopsy No. 3). Another female piglet which was obviously lame on July 15th and showed marked swelling of the limbs also died on July 17th (Autopsy No. 4). On July 18th a further castrated male piglet died (Autopsy No. 5). Another castrated male piglet showed lameness and swelling of the limbs and was brought into the Clinical Department of the Royal (Dick) School of Veterinary Studies. This piglet, which was given no treatment, appeared fairly bright and had a good appetite. The lameness and swelling gradually disappeared except for the left forelimb, which showed knuckling over at the carpus. The piglet was sent home in this state and has since completely recovered. Estimations of packed cell volume, haemoglobin level, total R.B.C. count, total W.B.C. count, differential white cell count (with supravital staining) and clotting time were carried out on blood from this piglet on July 21st and 27th, 1953. No significant deviation from the normal range was detected.

The remaining five piglets in the litter were lively and suckling, while those affected had huddled together under the straw as if to keep warm.

Autopsy Findings

Autopsies 1 and 2 (castrated male piglets). These showed a similar picture of marked pallor of the tissues and viscera with much free blood and large blood coagula in the abdominal cavity. The haemorrhage appeared to have arisen from the region of the inner inguinal rings. The skin wounds associated with the castration showed no evidence of gross haemorrhage. No further macroscopic abnormalities were observed in other tissues.

Autopsy 3 (female piglet). On reflecting the skin over the ventral aspect of the neck, a large haematoma was exposed, extending from the angles of the mandible to the sternum and penetrating deeply into the underlying muscles (Plate 1). No macroscopic abnormalities were observed in other tissues, apart from a general pallor.

Autopsy 4 (female piglet). Extensive subcutaneous haemorrhages were evident in both forelimbs and the left hind limb with only slight involvement of the right hind limb (Plate II). In addition, there were slight haemorrhages, involving the superficial muscles covering the ventral aspect of the neck. These haemorrhages appeared confined to the subcutaneous and intermuscular connective tissue. Subcutaneous oedema was also evident in some of these areas. No macroscopic abnormalities were observed in other tissues apart from a general pallor.

Autopsy 5 (castrated male piglet). This piglet showed a similar picture to that seen in Autopsies 1 and 2 except that in addition to much free blood in the abdominal cavity, there was a large firm coagulum attached in the region of the inner inguinal ring on the right side, causing displacement of the bladder to the left (Plate III).

Discussion

Warfarin (3 (alpha-acetonyl benzyl)-4-oxycoumarin) is a proprietary product and a derivative of dicoumarin. Following the recognition of dicoumarin as the active principle causing "sweet clover disease" in cattle, O'Connor (1948) carried out experiments on the use of this chemical as a rodenticide. Dicoumarin and its derivatives act by inhibiting the formation of prothrombin and by causing

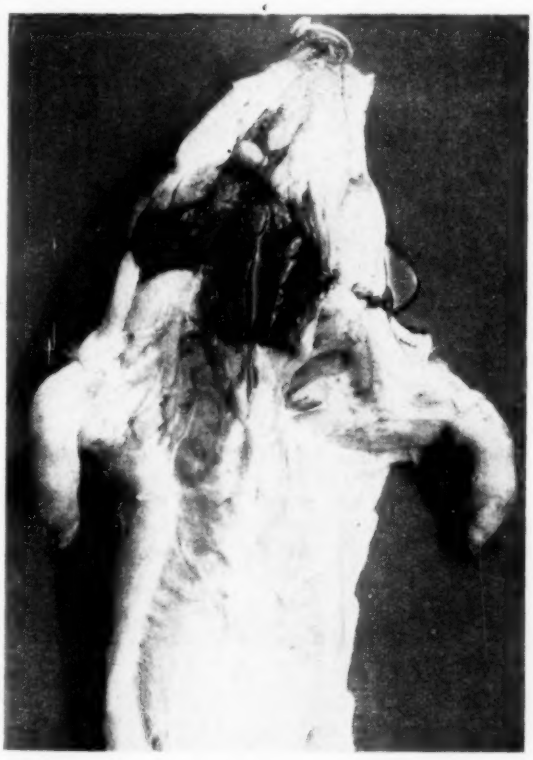

Plate I.

Autopsy No. 3.—Ventral aspect of head, neck and thorax with skin reflected to show the large haematoma (incised) present in subcutaneous and muscular tissues.

Plate II.

Autopsy No. 4.—Hind limbs with skin reflected to show the extensive subcutaneous haemorrhages present in the left hind limb.

Plate III.

Autopsy No. 5.—Ventral aspect of abdominal cavity with viscera *in situ* showing the large firm blood coagulum attached in the region of the right inner inguinal ring.

capillary damage (Hayes & Gaines, 1950). As a result, the normal process of haemostasis cannot take place and even minimal injuries to blood vessels may lead to fatal haemorrhage. Dyssegard (1952), however, stated that dicoumarin and its derivatives can also cause death in rats by its toxic effects upon the tissues, particularly the liver and myocardium. In addition, he described pronounced anaemia in the absence of haemorrhage.

My findings, however, indicate that haemorrhage was the primary factor responsible for death in this case; there being no macroscopic evidence of hepatic or myocardial degeneration. The joints showed no evidence of haemorrhage as was recorded by Christensen (1953).

According to the findings of several workers, the lethal dose of this rodenticide varies with the period over which it is ingested. Thus, several small daily doses have been shown to be more effective than doses given on alternate days for several days. Hayes & Gaines (1950) give the optimum dosage for rats as a total of 5 mg. per kg. bodyweight over a period of five consecutive days, death occurring in from 2 to 12 days. The findings of Dyssegard (1952) were similar to the above and he quotes Crabtree (1950), who found that a single dose of 15 to 500 mg. per kg. b.w. had only slight effects, resulting in the death of 10 out of 240 rats.

In the case described above, approximately 1½ lb. meal containing 0·025 per cent. Warfarin was consumed by the piglets, *i.e.*, a total of approximately 180 mg. Warfarin. Each affected piglet, therefore, could have consumed an average amount of approximately 30 mg. pure Warfarin over a period of several hours and had no further access to the baited meal, apart from traces in the chaff thrown into their pen.

In the case of poisoning in pigs recorded by Reihardt & Reihardt (1952), the pigs had had access to the baited food for approximately 12 days before castration. In the second case described by Christensen (1953), the pigs had had access to the poison for only four to five days but in the first case the pigs had had access for a longer period.

Experiments on the toxicity of Warfarin to pigs carried out at the Ministry of Agriculture Veterinary Laboratory, Weybridge (Stableforth, 1953), show that single doses of up to 3 mg. per kg. b.w. failed to produce any effects, while doses of 0·4 mg. per kg. b.w. given daily for seven days produced symptoms, and in some cases death.

My findings show that even small amounts of Warfarin, taken as a single dose over a period of a few hours, may have a toxic effect within three to six days.

In my opinion, therefore, the greatest care should be taken to ensure that domestic animals do not gain access to baited meal. This danger had been stressed previously by Hayes & Gaines (1950) following experimental feeding of rats, poisoned by Warfarin, to cats. In addition, Dyssegard (1952) quoted from a pamphlet, issued by a large European manufacturing company, concerning a dicoumarin derivative other than Warfarin, in which it is advised emphatically not to employ the preparation in pig sties. Christensen (1953) in his report on Tomorin poisoning stated that this rodenticide is laid down as a powder on the ground where rats are likely to run. The poison is picked up on the fur and feet of the rats which lick themselves and so become poisoned. Christensen also emphasised the dangers of these dicoumarin rodenticides to domestic animals, particularly to pigs which may eat poisoned rats, and further stated that attention is drawn to these dangers in the pamphlets published by the firms marketing these poisons in Denmark.

Summary

(1) A case of Warfarin poisoning is described in which five piglets from a litter of 11 died following ingestion of baited pig meal.

(2) Three male piglets died following castration as a result of severe haemorrhage from the spermatic vessels, while two female piglets died as a result of extensive subcutaneous haemorrhages associated with bruising.

(3) These findings re-emphasise the need for great care in the use of this rodenticide on premises where domestic animals may gain access to it.

Acknowledgments.—Acknowledgments are made to Mr. C. B. Davidson for drawing my attention to this case, to Mr. D. Mitchell for carrying out the haematological examinations, to Mr. I. S. Beattie for advice in the preparation of this paper and to Mr. R. S. Hood for the illustrations.

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ABSTRACTS

Effects of Repeated Blood Replacement with Dextran and Plasmosan in Dogs*

This study is entirely confined to the use of dextran and plasmosan in dogs only, as the authors stress that these apparently inert protein-free solutions do not have very similar effects in all mammals.

The article deals fully with the experiments carried out by the authors with clear tables and graphs of results, and they also give an exposition of the nature of plasmosan shock in dogs. Their experiments confirm that dextran would certainly appear to cause no undesirable reaction in the dog, and therefore its superiority over plasmosan in the treatment of blood loss in this animal. They draw no conclusion as to any possible effect the plasma substitutes may have on red cell regeneration. J. C. V. H.

* **Studies on the Effects of Repeated Blood Replacement with Dextran and Plasmosan in Dogs.** Clark, R., Malherbe, W. D., & Weiss, K. E. (1953). *J. S. Afr. Vet. Med. Ass.* **24**. 87–95.

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The Indications for Disc Fenestration in the Dog*

The authors divided disc protrusions into two types which they differentiate on pathologic-anatomy and clinical grounds. Type I is encountered in young dogs with chondrodystrophic characters, such as the Peke and Dachshund. The onset is sudden, resulting in a partial or total paraplegia which either persists or heals spontaneously. The cause is attributed to a systemic disc degeneration due to the nucleus pulposus being subjected to an early chondroid metamorphosis. There is a total rupture of the annulus fibrosus with prolapse of degenerated and calcified disc tissue. Type II is a senile phenomenon seen in all breeds. The symptoms, which are not characteristic, result from a bulging of the annulus fibrosus.

In a study of 561 dogs of different breeds, ages and sex, 282 disc protrusions were found in 93 cases, and in the same material 1,194 calcified discs were observed ; 71·6 per cent. of the prolapses occurred between the 11th and 12th thoracic, and the second and third lumbar vertebrae. No protrusions were encountered in the region that corresponds to the nine sternal ribs. Fifty per cent. of all prolapse cases were multiple, and 50 per cent. were localised to adjoining discs. In consequence, the authors suggest that the operation should not be limited to the disc indicated by myelography, but that the adjoining discs should be fenestrated at the same time.

From clinical observations on 90 dogs submitted to disc fenestration, it was concluded that the benefits obtained by removing the degenerated nucleus pulposus were due to a reduction in pressure, prevention of an increase in the prolapse and its stabilisation which assisted normal repair by decreasing the inflammatory changes in the spinal cord, nerves and epidural space.

A comparison is drawn between 21 cases treated conservatively and 26 treated surgically, but the observations on the former extend over six years, whereas the latter extend over a two-year period. The cases were chosen at random. Cases of all degrees are included amongst the surgically treated, but only those that left the clinic alive are included in the conservatively treated group ; 46·2 per cent. of the former group, compared with 14·3 per cent. of the latter group, made a complete recovery.

The progress of 56 dogs treated surgically by disc fenestration was observed for a period of one year. They were divided into four groups. Group I exhibited pain of various degrees and duration, Group II pain and slight paresis, Group III pain and grave paresis, and Group IV spastic or flaccid total paresis. Twenty-five made a complete recovery: Group I, 11 out of 25, Group II, 6 out of 9, Group III, 6 out of 11, and Group IV, 2 out of 21.

From their clinical experience and observations, the authors conclude that disc fenestration is indicated (*a*) for cervical disc protrusion, and (*b*) in cases showing slight or medium symptoms that have been treated without success, but point out that in this category, early operation hastens healing, prevents aggravation of symptoms, and reduces the risk of relapses which occurs most frequently in dogs which have a large number of degenerated (calcified) discs. The operation is not recommended for dogs showing grave symptoms, that are in the state of shock or whose general condition is bad.

The technique of the operation is not described, but the operation of cervical disc fenestration was satisfactorily demonstrated by a colour film. The dog was anaesthetised by the intravenous injection of nembutal, placed in dorsal recumbency with the head and neck extended. The skin was incised along the line of the trachea, and the disc exposed by blunt dissection. Fenestration was performed with a lancet making a square hole 3 by 3 mm., and the nuclear material removed with a fine scoop. J. H.

* * * * *

Amputation Through the Shoulder in the Dog*†

When it is decided to amputate a thoracic limb, the operator has to choose between either disarticulation at the shoulder or amputation a short distance below the elbow. Amputation through the shoulder should not be undertaken lightly as haemorrhage and shock may be severe. In addition, it cannot be performed rapidly and hospitalisation is lengthy but the aesthetic appearance is excellent. However, amputation below the elbow can be performed easily and quickly without much risk of haemorrhage or shock, but the appearance is not very good.

The author considers that disarticulation at the shoulder is obligatory in the following conditions : (i) when the injury is situated between the shoulder and elbow, and (ii) in paralysis of the brachial plexus or the major nerves of the thoracic limb. Two cases are quoted of brachial plexus paralysis which completely failed to heal when amputation was performed below the elbow. Since amputation below the elbow heal well when there is no paralysis, the author considers absence of nerve function to be responsible for the non-union.

The following operation technique is employed by the author for amputation through the shoulder, and is designed to prevent shock and promote rapid healing. An oval skin incision is made on the lateral aspect of the limb from where the axillary skin fold merges with the chest downwards to a point 2 inches below the shoulder and then upwards well forward of the shoulder, to end over the external jugular vein. A corresponding incision is then made in the medial aspect joining the ends of the first incision.

The cephalic vein and circumflex artery are exposed and ligated, and then the brachiocephalic, superficial and deep

* **The Indications for Disc Fenestration in the Dog.** Hansen, H., & Olsson, S. (1953). *International Veterinary Congress, Stockholm, Proceedings*, Part I. **2**. 207. (Section VII.)

* **Indications for and Technique of Amputation through the Shoulder in the Dog with a Note about Paralysis of the Brachial Plexus.** Hofmeyer, C. F. B. (1953). *J. S. Amer. Vet. Med. Ass.* **24**. 111–115.

† Many veterinary surgeons may feel that the aesthetic objection to a three-legged dog is such that the operation should never be performed.—*Editor.*

pectoral muscles are dissected through exposing the brachial artery and vein which are ligated. The radial, median and ulna nerves are then isolated and severed. Having ligated all major blood vessels and severed all major nerves, the incision is deepened down to the humerus which is exposed all round, approximately 2 inches below the shoulder joint, by separating the muscle insertions from the bone. Following disarticulation, the glenoid cavity is curetted and obliterated by suturing over it, with chromic catgut, the detached ends of the muscles. Finally, the subcutaneous fascin is approximated with a continuous catgut suture, the skin closed with interrupted silk sutures and the operated area bandaged tightly.

J. H.

* * * * *

Open Reduction for Correction of Coxofemoral Dislocations*

Recent and long-standing coxofemoral dislocations may be successfully treated by open reductions, when other methods fail.

Antero-dorsal dislocation is met most frequently and the authors believe many involve rupture of the teres ligament and tearing of the joint capsule. Haemorrhage occurs into the acetabulum and the subsequent clot allows insufficient room for return of the femoral head. Fibrous tissue replaces the blood clot in the acetabulum and also forms around the femoral head, rendering reduction impossible.

The skin is incised from the great trochanter of the femur to the stifle joint. The fascia lata is incised, exposing the vastus lateralis which is then separated from the rectus femoris as high up as possible. The femoral nerve, anterior femoral artery and vein must be avoided near the hip joint.

The fibrous tissue is removed from the acetabulum and the femoral head. Reduction is then easily accomplished. No attempt is made to suture the joint capsule. The fascial planes are closed with a few interrupted sutures and vertical mattress sutures are applied to close the skin wound.

Supplementary fixation, either by plaster cast or figure eight type of bandage, may be applied but is not essential.

L. C. V.

* **Open Reduction for Correction of Coxofemoral Dislocations.** Archibald, J., *et al.* (1953). *Vet. Med.* **48**. 273–275.

QUESTIONS IN PARLIAMENT

Rabbit Trap (Trials)

Mr. C. I. Orr-Ewing (January 19th) asked the Minister of Agriculture whether he has now considered the results obtained during the trials which have been conducted with the Imbra humane rabbit trap; and whether he is yet in a position to make a statement.

Sir T. Dugdale: The trials which are being carried out by county agricultural executive committees with improved Imbra traps are still in progress and I am not yet in a position to make a statement.

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Slaughterhouses

Mr. Padley (January 20th) asked the Minister of Food what expenditure has been incurred by his Department in respect of the maintenance of abattoirs in each year since the inception of the Meat Control Scheme in 1940; and whether he can make an estimate of the cost of structural improvements and extensions.

Major Lloyd George: Information is not readily available for the period since 1940; but over the past five years and for the 300 to 350 private slaughterhouses held on lease or requisition, the average annual expenditure on maintenance, repairs, improvements and extensions has been £125,000. Without undue labour this sum cannot be sub-divided among the several heads.

Mr. Burden asked the Minister of Food if he will restore the provision and management of slaughterhouses to local authorities.

Major Lloyd George: I hope to be able to make an early announcement on this and other questions about the licensing and use of slaughterhouses in the period following decontrol.

Mr. Burden asked the Minister of Food if he will approve the provision of a public abattoir to serve the Medway towns.

Major Lloyd George: An interdepartmental committee is drawing up a siting plan for slaughterhouses throughout the country under the policy of moderate concentration. I would ask my hon. Friend to await this report. The needs of the Medway towns will be fully taken into account in drawing up the plan.

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Cruelty to Animals Act

Mr. Peter Freeman (January 21st) asked the Secretary of State for the Home Department the names of the inspectors appointed by him under the Cruelty to Animals Act, 1876; what salaries each receive; and which of them has held a licence to perform such experiments at any time.

Sir D. Maxwell Fyfe: The information for which the hon. Member asks is as follows:—

Chief Inspector: Dr. P. L. C. Carrier, M.D., B.S., M.R.C.P., M.R.C.S., D.P.H.: Salary £2,000.

Inspectors: Dr. F. Elliott, M.B., B.S., T.D.; Dr. E. J. Fitzgerald, M.D., B.Ch., B.A.O.; and Group Captain G. Struan-Marshall, O.B.E., M.R.C.S., L.R.C.P., L.D.S., R.C.S., D.P.H., D.T.M. & H. (retd.); their salary scale is £1,250 to £1,725 to which there is at present an addition of £100 per annum.

Group Captain Struan-Marshall held a licence up to 1925.

Mr. Peter Freeman asked the Secretary of State for the Home Department whether he will state the salaries received by each of the members of the Advisory Committee on Experiments on Living Animals under the Cruelty to Animals Act, 1876; how many meetings were held in 1953; and how many times he has consulted them and been consulted by them.

Sir D. Maxwell Fyfe: The members of this Committee give their services free. One meeting was held in 1953, at which three cases were discussed. In all, 126 cases have been referred by my predecessors and myself to the Committee for their advice.

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Myxomatosis

Sir W. Smithers (January 21st) asked the Minister of Agriculture if, in view of the importance of domestic rabbits to the individual's private larder and to the export trade, he will make a statement concerning the research he is carrying on to help the domestic rabbit keepers of this country to prevent their domestic rabbits being attacked by the rabbit disease known as myxomatosis.

Sir T. Dugdale: Research is in progress at the Ministry's Veterinary Laboratory at Weybridge with a vaccine that is known to give rabbits a reasonable degree of protection. I am advised, however, that domestic rabbits can be protected by the use of insect screens and insecticides against mosquitoes which may carry the disease.

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Experiments on Living Animals

Mr. Peter Freeman (January 21st) asked the Secretary of State for the Home Department how many experiments on living animals have been conducted under the Cruelty to Animals Act, 1876, in connection with cancer to the latest known date; and what results have been obtained as to the cause or cure of this disease.

Sir D. Maxwell Fyfe: From 1907, when these figures were first kept separately, to the end of 1952, 1,367,820 experiments were carried out in connection with cancer research. It is not within my province to assess the results of such experiments.

Mr. Peter Freeman asked the Secretary of State for the Home Department how many applications for a licence were refused in each category in each year to conduct an experiment on a living animal since the Act was passed in 1876; and what were the reasons for the refusal in each case.

Sir D. Maxwell Fyfe: This information is not available.

OPENING OF NEW B.V.A. HEADQUARTERS

The official opening of the new British Veterinary Association Headquarters took place on Thursday, January 21st. The guest of honour was the Duke of Norfolk. Among other guests who were received by the President and the officers of the Association were: Professor R. E. Glover and Mrs. Glover; Mr. and Mrs. J. N. Ritchie; Sir Weldon Dalrymple-Champneys; The Presidents of Divisions and their ladies; Dr. A. W. Stableforth; Mr. C. P. Quick, representing the Ministry of Agriculture; Mr. W. G. R. Oates, Registrar of the Royal College of Veterinary Surgeons; Mr. Hogg, representing Lord Merthyr—President of the R.S.P.C.A.; Mr. Johns, representing the National Canine Defence League; Mr. Stephens; and Mr. Seymour, of Messrs. Elliott, Son and Boyton.

A large company was present in the splendid double drawing room of the house, whose architecture and amenities were much admired. The new interior decorations, the beautiful Adam ceilings of the principal rooms, the plaques on the main staircase (believed to be the work of Josepn Rose, who was plaster worker to Robert Adam), and the two superb chandeliers which have been left in the care of the Association by the last tenant, all excited favourable comment, and it was generally felt that the Association now had a headquarters fully worthy of its prestige and history.

The President

In introducing the Duke of Norfolk, Mr. Thomson said it gave him great pleasure, on behalf of the British Veterinary Association, to welcome the gathering to their new home. Members would appreciate that much of the work of finding the house had been carried out by others than himself, as the search had been going on for several years. In this respect he would like to mention the names of Dr. W. R. Wooldridge and Mr. A. M. Graham.

With the assistance of the Premises Sub-committee and the Surveyor, Mr. Seymour, a great deal of work had gone into the arrangements for converting what had been a private dwelling into suitable offices without altering the main character of the building; and he also thought that a sincere vote of thanks should be extended to Mr. Knight, Miss Smith, and all the members of the staff for supervising the removal from Gordon Square, for arranging the committee meetings held during the week, and for putting on that particular function.

The President went on to say that a house-warming is the more enjoyable when friends are present, and that the profession was fortunate in having many good friends. He was glad that so many were able to be present on that occasion and he hoped they would enjoy the amenities of the building.

Mr. Thomson said it gave him great pleasure to introduce the Duke of Norfolk, who had kindly accepted the invitation to declare the premises open. As the "director" of the most outstanding event of the past year he was a world figure; but to the profession he was a very good friend—a landowner who took a real personal pride in agriculture, and a keen interest in all that appertained to its advancement. In the veterinary field he had shown his particular interest in the development of the Animal Health Trust, of which he was President.

In calling upon the Duke of Norfolk to declare the building open the President said that the Association hoped to commemorate the occasion by placing a small plaque in the entrance hall.

The Duke of Norfolk

First of all, the Duke said, he would like to thank the Association for asking him to be present and to declare the building open. He thought the Council should be congratulated on purchasing such a fine Adam house, and for preserving the dignity of a spacious building. In these days one was usually faced with some "ghastly modern offices," but here, he felt, the old atmosphere had been preserved even though modern amenities had been introduced.

He thought it was a very good thing that the Association

had invested in such a home for 999 years. It reflected the veterinary surgeon's confidence in the growing prestige of his profession; his field was a wide one, and both farm and domestic animals came under his care and attention. The Duke hoped that the day's proceedings would make it clear to people outside the profession that it was intended to try to do still more for the welfare of animals.

In comparing the work of the human doctor with that of the veterinary surgeon, whilst he agreed that both were called upon to be "out and about," he thought that most people would agree that many more patients were taken to the doctor than animals were taken to the veterinary surgeon. The latter had, perhaps, to spend hours on one particular farm dealing with a large number of patients away from his surgery and its amenities.

He thought the profession was evoking ever greater confidence from the public, and he wished the Association every success in its work. He had come in contact with veterinary surgeons from different parts of the world through his association with the Animal Health Trust—an organisation which, he hoped, would soon be firmly established. It was necessary for everyone to pull together to improve the health and productivity of animals.

The Duke of Norfolk concluded by saying how much he enjoyed taking part in this "family affair," he wished the Association every success and thanked the President for his hospitality.

Mr. Graham

On behalf of the members of the Association Mr. Graham said that he would like to thank the Duke for performing the opening ceremony. He could think of no one, he said, better fitted to do so. As the President had mentioned, the Duke, besides being a national figure, was also a very prominent agriculturist, interested in many matters of great importance to veterinary surgeons. He was well qualified to speak on the work being done by the profession, and it was most gratifying to hear him talk of it in such appreciative terms.

The President had referred to the part which Dr. Wooldridge and he (Mr. Graham) had played in the selection of the property; and in this connection he would like to pay the warmest of tributes to the Premises Committee. This, he said, was a very memorable day for the Association. He hoped it would continue to prosper in its new home as it had in the old.

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Members of the Association have reason to be very grateful to the officers and other elected representatives who took an enormous amount of trouble not only to find a suitable headquarters—as one member of the Premises Committee put it "we tramped through miles of cold passages and explored I don't know how many very cold houses"—but to have it converted effectively and decorated in such admirable taste. Grateful recognition is due also to the work of the Honorary Treasurer and of the Finance Committee, through whose prudent management of the Association's affairs the purchase of so fine a property was made possible.

NOTES AND NEWS

Diary of Events

Feb. 4th.—General Meeting of the Central Veterinary Society, B.V.A., at the Royal Veterinary College, N.W.1, 6 p.m.

Feb. 5th.—General Meeting of the Sussex Veterinary Society, "Old Ship Hotel," Brighton, 2.30 p.m.

Feb. 5th.—General Meeting of the Society for the Study of Animal Breeding at the Wellcome Research Institute, 183-193, Euston Road, N.W.1, 2.15 p.m.

Feb. 10th.—Meeting of the Editorial Committee at 7, Mansfield Street, Portland Place, W.1, 2.30 p.m.

Feb. 11th.—Royal (Dick) School of Veterinary Studies Annual Ball, in the Assembly Rooms, George Street, Edinburgh, 8.30 p.m. Proceeds to the Victoria Veterinary Benevolent Fund.

Feb. 11th.—Meeting of the Essex Veterinary Society at the Institute of Agriculture, Writtle, Nr. Chelmsford, 7.30 p.m.

Feb. 12th.—Annual Ball of the Glasgow University Veterinary Medical Association, the Rhul, Sauchiehall Street, Glasgow, 8 p.m.

Feb. 12th.—Annual General Meeting of the North of Ireland Veterinary Association, Union Hotel, Donegall Square South, Belfast, 5 p.m.

Feb. 17th.—Meeting of the Royal Society of Medicine at 1, Wimpole Street, W.1, 5 p.m.

Feb. 20th.—University of Liverpool Veterinary Society Annual Ball, in the Students' Union, Bedford Street, Liverpool.

Mar. 25th.—V.V.B.F. Ladies' Guild: North of Scotland Division, B.V.A., Annual Dance, Aberdeen (*see Notice*).

Mar. 26th.—Annual Dinner and Dance of the Yorkshire Division, B.V.A., Parkway Hotel, Leeds.

Sept. 19th—25th.—72nd Annual General Meeting and Congress of the British Veterinary Association at Torquay.

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R.C.V.S. Committee and Council Meetings

The above meetings will be held at 10, Red Lion Square, London, W.C.1, on February 3rd, 4th and 5th.

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PERSONAL

Births.—Basinger.—On January 19th, 1954, to Sylvia, wife of Donald Basinger, M.R.C.V.S., 23, St. Hilda's Road, Hexham, Northumberland, a daughter—Sally Frances.

Hawkins.—On January 14th, 1954, at the County Hospital, Bangor, to Iris, wife of Albert Hawkins, M.R.C.V.S., of Glantryweryn, Bala, a daughter—Linda Susan.

McTaggart.—On January 15th, 1954, at Helme Chase, Kendal, to Iselle (*née* Jackson), wife of H. Scott McTaggart, B.Sc., M.R.C.V.S., of Kirkby Stephen, Westmorland, a son—Roderick James.

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Retirement of Captain William Watt, M.R.C.V.S., D.V.S.M.—On Friday, January 8th, Captain Watt, Superintending Veterinary Officer, Ministry of Agriculture and Fisheries, Stirling, was the recipient of a silver salver presented by the veterinary and clerical staffs of the four Divisional offices (Stirling, Paisley, Cupar and Oban) which form the area which he served. He was also presented with an autograph book containing the signatures of the area staff, and these included some signatures of members of the Ministry's staff who had been transferred from the area but who wished to be associated with the presentation.

There was a full representative attendance at the Divisional Office, Stirling, where Mr. George Rennie, Divisional Veterinary Officer, Oban, made the presentation. Members of the veterinary and clerical staffs from the various offices also spoke, and Captain Watt made suitable acknowledgment; in a short speech he recalled the vast changes he had seen during his 34 years of service with the Animal Health Division. W. G.

Appointment.—We have been informed that Mr. Norman S. Barron, B.Sc., Ph.D., M.R.C.V.S., has accepted an invitation by Agricultural Food Products of Hammersmith, producers of Vitamealo and other agricultural products, to take charge of their advisory organisation relating to animal husbandry and veterinary matters. He will take up his new appointment as from April 1st. His address will be the University, Reading, until further notice.

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Ministry of Agriculture Veterinary Field Staff.—Mr. J. R. Kerr, M.R.C.V.S., Divisional Veterinary Officer, has been transferred from Nottingham to Edinburgh, and Mr. W. J. McIlroy, F.R.C.V.S., Divisional Veterinary Officer, has been moved from Head Office to Nottingham.

Mr. P. A. F. O'Neill, B.V.Sc., M.R.C.V.S., Veterinary Officer, has been transferred from Mold to Weybridge.

Mr. R. H. Wilcox, M.R.C.V.S., Veterinary Officer, has been transferred from Carmarthen to Dingwall.

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THE ANIMAL HEALTH TRUST

The following gentlemen have accepted invitations to join the Council of the Animal Health Trust:—

The Duke of Devonshire.

The Earl Peel.

Dr. A. W. Stableforth, M.R.C.V.S., D.V.S.M.—Director of the Ministry of Agriculture's Laboratories at Weybridge.

Mr. Thomas Peacock, C.B.E.—Chairman of the Milk Marketing Board.

Sir William Cooper.

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R.C.V.S. OBITUARY

Taylor, John Lemmon, M.R.C.V.S., 21, Church Street, Coatbridge, Lanarks. Graduated Glasgow, May 29th, 1912. Died January 18th, 1954.

Todd, S. Malcolm, B.V.Sc., M.R.C.V.S., at 21, Moorend Lane, Dewsbury Moor, Yorkshire. Graduated Liverpool, July 18th, 1953. Died January 20th, 1954; aged 25 years.

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JOHN TAYLOR, M.R.C.V.S.

A Personal Tribute

Mr. J. Birrell writes:—

John Taylor, of Coatbridge, passed from this life on Sunday, January 17th, 1954. He had carried on his practice in Church Street for 36 years, and in that time he had piloted many students through their early years. I was one of that fortunate number. He can only be described as a good man; he was skilled professionally, but he gave his students more than technical ability. He taught them that a veterinary surgeon must be greater than his profession, and he taught them humanity and a right way of life. He had a great sense of humour, too, and it is little wonder that his clients revered him. The profession in the West of Scotland and the townspeople of Coatbridge must bear the loss of a very honourable gentleman. I know that all my colleagues who knew him join with me in extending to Mrs. Taylor and his family our deepest sympathy.

Major Andrew Spreull, D.S.O., T.D., D.L., M.R.C.V.S.

PERSONAL TRIBUTES

Mr. W. Nairn writes:—

On the sad occasion of the passing of my old friend Major Andrew Spreull, of Dundee, I should like to pay this tribute to one who was well known to all the members of our profession in Scotland, and who was highly appreciated as a practitioner. While he was keenly interested in all the various species of our patients, I would say that he was particularly good in equine practice. He enjoyed the advantage of following in the footsteps of a very competent father and, in turn, he has now passed on the almost traditional skill to his sons, Andrew and James. Looking at his career as a whole, I would say that he was a man of action, driven by a great reserve of restless energy, and this was very noticeable when anyone fell short of his expectations.

He served for 32 years in the Territorial Force: in 1900, as a student, he went with the Fife and Forfar Yeomanry to South Africa and it was a great honour for the trooper to be specially mentioned by Lord Kitchener in his dispatches. During the first European war he served as an officer in various Divisions, and held temporary positions in the R.A.V.C., retiring with the rank of Major. In addition to medals, he was awarded the D.S.O. for his services. In the most recent war, in spite of the handicaps of age, accidents and illnesses, he took an active part in Home Defence services, and at last, in 1943, the grateful city in which he was born and in which he had laboured most of his life appointed him Deputy Lieutenant for the County of the City.

I recall, with much pleasure, the years I travelled with him to London to attend the meetings of the Council of the R.C.V.S. It was then that I learned of his excellent artistic gifts, and he exercised these talents sometimes by sketching members of Council for the pleasure of his neighbours.

He has left a fine record of service behind him; I would assure his widow and his family that the sympathy of the profession goes out to them most generously at this time.

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With the passing of Major Spreull there is severed a link with a previous generation which we who are younger know only by repute. In a period when the horse occupied an unchallenged position he found ample opportunity to exercise his skill in an environment for which he was pre-eminently fitted. His reputation as an expert in all matters relating to the horse stood high, and he was extensively employed and widely consulted. During the course of his long career there are many people, both inside and outside the profession, who will recall his energetic and painstaking devotion to his calling which took precedence at all times over his other interests.

As horse practice declined he developed and established an extensive connection in the farming community to which he gave a long and faithful service. As a soldier, he served in the Boer War and in the war of 1914-18. In the last war he took an active part as an administrator in addition to the heavy calls made upon him professionally—and this despite his all too frequent ill-health. His honours were many and they gave ample testimony to his worth.

In this great loss we extend to Mrs. Spreull and his family our deepest sympathy. J. J. M. & W. A. M.

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William Brown, M.R.C.V.S.

PERSONAL APPRECIATIONS

As one who has known William Brown for most of the years during which he has been connected with *The Veterinary Record*, I should like to add my personal appreciation of his never-failing friendship and kindness. Nothing was ever too much trouble for him. As an older member his loss leaves a gap which it will be impossible to fill.

O. V. G.

Major R. F. Wall writes:—

Unfortunately I must have missed seeing an earlier *Record*, and I had a great shock when I saw the report of the funeral of my friend Mr. Brown, whom I have known for many years.

I hasten to offer my condolences to his family and to pay my respects to the memory of one who has been invaluable to the profession and a good friend to us all when we were in need of help or advice. He was an admirable gentleman in every sense of the word and will, indeed, be missed and mourned.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

ANTHRAX:

Ayr.—Old Toll, Ayr (Jan. 18).
Essex.—Little Bordeaux Farm, Little Chesterford, Saffron Walden (Jan. 20).
Gloucs.—Ivy Farm, Breadstone, Berkeley (Jan. 18).
Lanark.—Parkhead Farm, East Kilbride, Glasgow (Jan. 19).
Lancs.—Yealand Hall Farm, Yealand Redmayne, Carnforth (Jan. 20).

FOOT-AND-MOUTH:

Monmouth.—Court Farm, Llanmartin, Newport (Jan. 24).

FOWL PEST:

Caernarvon.—48, Hyfrydle Road, Talysarn, Penygroes (Jan. 22).
Glamorgan.—Poultry Cotes, Densfield, Pwllgwaun (Jan. 20).
Hants.—69, High Street, Alton (Jan. 20).
Herts.—Harthall, Hyde Lane, Hemel Hempstead (Jan. 23); Margaret House, Barley, Royston (Jan. 24).
Kent.—The Lower Piggeries, Powder Mill Lane, Southborough, Tunbridge Wells (Jan. 18).
Lancs.—Midgeland Farm, Marton, Blackpool (Jan. 18); Francis Green Farm, Ribchester, Preston (Jan. 20); Dairy Farm, Chipping, Preston (Jan. 21); Poultry Cabins, Sunnyside, Liverpool Road, Rufford, Ormskirk; Baldrine Poultry Farm, Nutt Lane, Simister, Prestwich (Jan. 23).
Lincs.—Sleaford Road, Heckington, Sleaford; Co-op Farm, The Green, Welbourn, Lincoln (Jan. 19); Great Hales, Sleaford; 6, Cawood Lane, Gosberton, Spalding; Myrtle Cottage, Welbourn (Jan. 21); Burtts Cottage, Welbourn, and Stone Lea, Welbourn, Lincoln; Crofton Farm, Osworby, Sleaford (Jan. 24).
Monmouth.—14, Salisbury Terrace, Varteg, Pontypool (Jan. 20).
Norfolk.—The Technical Site, Aerodrome, Quidenham (Jan. 18); Crown Farm, Horsford, Norwich (Jan. 19); East Rope Walk, King's Lynn (Jan. 22).
Nottingham.—Manor Farm, Radcliffe-on-Trent (Jan. 21); Mill Field, Walesby, Newark (Jan. 22).
Suffolk.—New Street, Haughley, Stowmarket (Jan. 20).
Warwicks.—Cress Hill, Welford-on-Avon, Stratford-on-Avon (Jan. 23).
Yorks.—Lone House, Poultry Farm, Cowling, Keighley (Jan. 20); Poultry Run, West End Hotel, Eckington (Jan. 23).

SWINE FEVER:

Cambs.—Bushel, Haslingfield, Cambridge (Jan. 22).
Carmarthen.—Caebychabach, Llangadock (Jan. 21).
Ches.—Piggery, Green Lane, Wallasey (Jan. 21).
Cornwall.—Gunwalloc, Helston (Jan. 18); The Green, St. Martin-in-Meneage, Helston (Jan. 20).
Essex.—Brookside, Tudwick Road, Tiptree, Colchester; Gate House Farm, Birch, Colchester (Jan. 18); Twin Oakes, Thorpe Road, Hawkwell, Hockley (Jan. 22).
Glamorgan.—Neuadd Farm, Lower Brynauman, Ammanford (Jan. 21).
Gloucs.—Sun-Nap Cottage, Harrow Hill, Drybrook (Jan. 18).
Isle of Ely.—Dams Farm, Coveney (Jan. 19).
Herts.—Hill End Farm, Mill Green, Hatfield (Jan. 19).
Hunts.—Broadals Farm, Fortyfoot Bridge, Ramsey (Jan. 21).
Lancs.—Pendlebury Farm, Bold, Widnes (Jan. 21); 104, New Lane, Eccles (Jan. 23).
Lincs.—Sawcliffe Farm, Roxby, Scunthorpe (Jan. 18); The Mill, High Street, Blyton, Gainsborough; 19, West End Road, Epworth, Doncaster (Jan. 19); Sawcliffe Farm, Roxby; School Lane, Appleby, Scunthorpe (Jan. 20); Marsh Farm, Sea Lane, Wrangle, Boston (Jan. 23).
Montgomery.—Grolfa, Welshpool (Jan. 23).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

R.C.V.S. ANNUAL FEES*

Sir,—If the retired M.R.C.V.S. wishes to keep his name on the Register it will cost him about £1 18s. out of his gross income because he has no expense account from which he can deduct the amount due. This point was checked with an accountant some years ago and he confirms the fact.

But why should he want to keep his name on the Register nowadays? In the past the Register has been a dignified, professional publication giving the names of all the members of the Royal College of Veterinary Surgeons. Now it looks as though it is going to be just a business proposition giving only the names of those who have paid their annual fee. In fact, a very powerful debt collecting agency.

On qualifying in 1899, I went up to 10, Red Lion Square to pay my fee and to obtain the "receipt" in the shape of my diploma. When the details were settled the Registrar remarked, "Your name will now be placed on the Register of the Royal College of Veterinary Surgeons, and will remain there as long as you live." There is not the slightest doubt that that remark would have been confirmed by every member of the Council of that period, and it applied to every member of the profession who qualified before 1920.

When the Act of 1920 was passed, making it legal to charge an annual fee, the Act was very careful not to tamper in any way with the Register. If necessary, the fee had to be collected by due legal process, and if it could not be so collected the College had to go without the guinea—but it could not remove the member's name from the Register.

Well, the Registrar was very nearly right. The Council have honoured their agreement for 54 years, but now they seem to have other ideas on the matter.—Yours faithfully, ARNOLD SPICER, Crabwood, Oxted, Surrey. *January 16th*, 1954.

* *Note.*—Owing to the fact that the President of the R.C.V.S. is dealing with this matter personally, the Committee have decided to terminate this correspondence.—*Editor.*

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THE ANIMAL HEALTH TRUST

Sir,—Members of the profession have received this year the circular letter, undated, from the Royal Veterinary College, on the affairs of the Animal Health Trust.

About these the Milk Marketing Board and the National Farmers' Union have already been consulted. The profession is now asked for financial and moral support to save this somewhat top-heavy and certainly expensive organisation, which seems to have enjoyed no inconsiderable support from a few very generous subscribers, the proceeds of film premières, circus performances, and, not least, the greyhound racing industry (though we are not informed in the letter of the financial state of the canine section).

One would wish to know what is the nature of the services that this Trust can furnish that are denied to the specialists and scientists of the colleges with their fine research institutes.

It is not out of place to refer members to a report of the fourth annual dinner of the University of Bristol Centaur Society, where the principal guest, a leader of the profession, after paying a great and just tribute to the general practitioners, advocated "sustained contact with one's old college in order to keep abreast of modern developments in veterinary science."

The reference to the Trust as a "lone prospector" is not a happy one. General practitioners are well aware of the real lone prospectors and daily rely upon them for help and advice. And there are other long-established research stations which have always made the *raison d'être* of the Trust questionable. Thus it is not at all apparent that, on the disappearance of the Animal Health Trust, British farm livestock owners will be within any measurable approach to disaster.

In conclusion, one is indeed thankful that Government sponsorship is not all-embracing, but now it is even more debatable how much longer the limited happiness of the present state of the profession may continue. *Facilis descensus Averni.*—Yours faithfully, LIONEL GOODALL, Cilroc, Shellwood Cross, Leigh, Surrey. *January 18th*, 1954.

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MYSOLINE IN VETERINARY PRACTICE

Sir,—I have received from Professor R. Florio, of the Toulouse Veterinary School, a short account of his experiences with Mysoline, the new anti-convulsant drug, and as I feel that this will be of interest to veterinary surgeons in this country I give below a translation of his work:—

A study has been made of the new anti-convulsant drug Mysoline, which is 5-phenyl-5-ethyl-hexahydropyrimidine-4:6-dione.

Preliminary work in investigating toxicity and optimum dosage was carried out in 12 dogs of various ages, breeds and weights, including three pregnant bitches. The drug was then used on a number of clinical cases and compared with some of the drugs more commonly used in nervous disease in the dog.

The toxicity of Mysoline was found to be extremely low, and no pathological effects were seen with doses of up to 75 mg. per kg. *Post-mortem* examination revealed no changes in the bowel, liver or kidney of any of the treated animals and pregnancy was undisturbed.

In a few cases mild side effects were noted at dosage rates over 65 mg. per kg., but these subsided following reduction of the dose or the withholding of the drug. They took the form of apprehension, dilation of the pupils, nystagmus, and occasionally salivation, and varied in degree with the size of the dose.

In therapeutic doses the drug was completely harmless and even appeared to have some tonic effect. This we ascribe to stimulation of the appetite by its slightly bitter taste.

The dose of Mysoline necessary to obtain control of nervous symptoms appears to lie between 40 and 50 mg. per kg., this being divided into three parts and given every six hours. Once control is established it can be reduced to about 35 mg. per kg. daily, but we disagree with Lambert (1953), who found that doses lower than this were effective. Treatment must be continued for three to four weeks in epilepsy and for at least one week following meningo-encephalitis. If treatment is discontinued too early relapses will occur.

We have so far treated 40 dogs of various breeds with clinically occurring nervous conditions as follows:—

True epilepsy: cured 5; improved 4; slightly improved 1; no effect 2.

Post-distemper epilepsy: cured 4; improved 2; slightly improved 2; no effect 3.

Nervous syndrome associated with hard pad disease: cured 2; no effect 4.

Chorea: no effect in 10 cases.

An attempt was made to prevent the onset of nervous symptoms following virus diseases such as canine distemper and hard pad by the prophylactic administration of Mysoline in the early stages of the disease. Five out of eight cases remained free of nervous involvement. Of the others two developed chorea, and a third showed symptoms of meningo-encephalitis and was destroyed.

The general conclusion is that Mysoline is an excellent anti-epileptic drug and a useful supportive agent in the treatment of virus disease. It has, however, no action in chorea. It constitutes a considerable advance on other drugs used in the control of nervous disorders of dogs, being more active than the barbiturates, hydantoin compounds or bromides, and showing none of the undesirable hypnotic effects or gastric disturbances associated with their use.

—Yours faithfully, W. T. HARROW, I.C. (Pharmaceuticals) Ltd., Fulshaw Hall, Wilmslow, Manchester. *January 19th*, 1954.

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